

REMARKS

Claims 1-6, 8-19, 21-32 and 34-39 are present in this application. Claims 1, 14, 27 and 39 have been amended so as to include the limitation of dependent claim 7, 20, 33 and 40 directed to the low chamfer angle. New claim 41 depends from claim 1 and is also directed to the low chamfer angle. No new matter has been added.

The present invention provides a method for forming an elongated torque-transmitting coupling with an elongated overflow groove by (see paragraph [0012])

forming at least one fitting having an elongated tube conforming area. The forming area includes a material overflow groove and multiple flat surfaces. The forming area has an associated tube arc length that is approximately equal in length to a formed area length of the flat surfaces with the elongated overflow groove. An elongated tube is procured. The elongated tube is formed onto the tube conforming area to form the torque-transmitting coupling.

[0013] The present invention has several advantages over existing torque tube manufacturing methods. One advantage provided by an embodiment of the present invention is the provision of a torque-transmitting coupling having an associated tube arc length that is approximately equal in length to a formed chamfer area length of the chamfer surface and the elongated overflow groove of the coupling. This provides a torque tube with uniform wall thicknesses over chamfer areas that are not in tension or compression. Such provision provides a torque tube with increased fatigue life, increased axial and torque load strength, minimizes tube weight, allows for increased tube material variation, and decreases end fitting manufacture costs and torque tube raw material costs.

[0014] Another advantage provided by an embodiment of the present invention is the provision of having chamfer areas with chamfer angles of approximately 20°. This provides a torque tube with increased strength and less susceptibility to cracking in the chamfer areas, thus providing a torque tube with increased fatigue life.

The Examiner has rejected all of the claims on the ground of nonstatutory obviousness type double patenting over Claims 1-20 of U.S. Pat. 6,932,118 to Saha et al.

in view of U.S. Pat. 5,983,478 to Dolan. Two terminal disclaimers are submitted herewith which will moot the double patenting ground of rejection.

The Examiner has rejected claims 1-6, 9, 11-19, 22, 24-32, 35, 36 and 38-40 under 35 U.S.C. 102(b) as being anticipated by Dolan ('478) (It is noted that the cited patent and the instant application are assigned to the same assignee). In setting forth his rejection, the Examiner notes that Dolan discloses "the recited torque tube and method of forming it comprising forming at least one fitting 34 having an elongated tube conforming area 36 formed as a chamfer area 56 having an upper surface 58 and the lower surface 66 where the chamfer angle is recited as being within the range of 30-55 degrees..." As is repeatedly stated in the specification, the reduction in the chamfer angle from the heretofore conventional 40-45° to the 20-25° as taught by the applicants is responsible for the advantages of the applicants' torque tube. Attention is called to paragraphs 57 and 58,

[0057]... As chamfer angles 96 are decreased, the amount of thinning of the tube wall 102 is decreased, as illustrated by curve 120. Unfortunately, ability to decrease the chamfer angles 96 is limited by strength of the coupling 84 between the elongated tube 86 and the fitting 80. The smaller the chamfer angles 96 the less force is needed to axially pull out the fitting 80 from the elongated tube 86. Also, for every smaller increment in chamfer angles 96 there is smaller difference in thickness of the formed tube wall 102. For example, when the chamfer angles 96 are decreased from 45° to 40°, the difference in thickness 103 is approximately 2%, unlike when the chamfer angles 96 are decreased from 25° to 20°, the difference in thickness 103 is approximately 0.8%.

[0058] As known in the art, it is desired that the torque-transmitting coupling 84 be stronger than that of the elongated tube 86 itself and be able to withstand fatigue loading for a period exceeding approximately four times a service life of the aircraft 62. The greater strength of the torque-transmitting coupling 84 over that of the elongated tube 86 better assures that a failure in the coupling 84 does not occur during loading. Thus, in order to have a torque-transmitting coupling 84 that has the desired strength and is formed so as to minimize cracking in

the chamfer portions 105, chamfer angles 96 of approximately 20° are utilized.

Dolan '478 is directed to electromagnetically forming a metal tube onto an end fitting to establish a torque-transmitting coupling. Dolan '478 is totally silent on the significance of the chamfer angle in realizing the desired results of wall thickness and coupling strength.

All of the claims contain this limitation so that Dolan '478 cannot serve as an anticipation reference. The rejection should be withdrawn.

Claims 7, 8, 20, 21, 33 and 34 have been rejected as unpatentable over Dolan '478 in view of Arena ('872). The Examiner states that the "patent to Dolan discloses all of the recited structure with the exception of forming the chamfer angle to lower angles such as 20 degrees." He concludes that it would have been obvious to one skilled in the art to modify the chamfer angle in Dolan to be lower than 30 degrees, including at least as low as 20 degrees, as suggested by Arena as such is disclosed as the known range limitations provided for chamfers of torque tubes to still allow for an adequate connection where changing the angle is a known expedient choice as suggested by Arena to as such is an equivalent angle useable and would provide satisfactory results while needing less preparation of the fitting. The applicant has considered the Arena patent for method of fabricating a torque joint but can not find any teaching or suggestion in Arena with respect to chamfer angles and specifically to lower the chamfer angle to achieve special advantages.

Claims 10, 23 and 37 are rejected under 35 U.S.C. 103(a) over Dolan '478 in view of Freeman. The Examiner contends that the "patent to Dolan discloses all of the

recited structure with the exception of providing an alodine coating to further protect the tube from corrosion. The patent to Freeman discloses that it is old and well known in the art to coat metals with various coatings including paints and alodine to protect the metal from corrosion. It would have been obvious to one skilled in the art to modify the tube in Dolan by providing an alodine coating along with the paint coating to provide extra protection against corrosion as suggested by Freeman where such would result in a tube that would last longer due to the extra protection thereby reducing the need for replacement.”

Even if the modification were made as suggested by the Examiner, there still would be no teaching of the lowered chamfer angles (20° to 25°) as required in the applicants’ invention and the benefits directly associated with this feature.

It is submitted that all of the claims in the application are allowable to applicants and notification to this effect is respectfully requested.

Respectfully Submitted,
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